

# High Performance Lithium Sulfur Battery with Novel Separator Membrane for Space Applications, Phase I

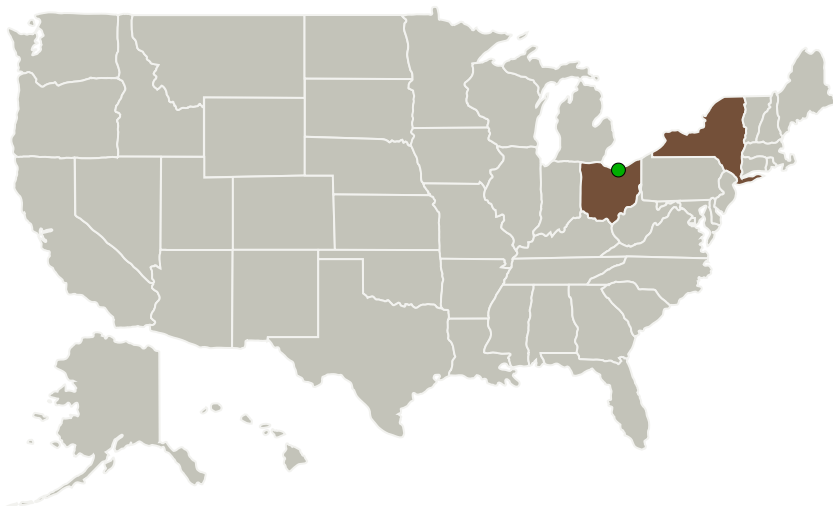
Completed Technology Project (2014 - 2014)



## Project Introduction

For NASA's human and robotic mission, the battery with extremely high specific energy ( $>500$  Wh/kg) and long cycle life are urgently sought after in order to reduce the payload weight. Current state-of-the-art lithium ion batteries, such as graphite/LiCoO<sub>2</sub> or graphite/LiFePO<sub>4</sub> systems, have limited specific energy to around 220 Wh/kg on the cell level. In order to meet the future NASA mission requirements, new out-of-box battery chemistries and components need to be developed. On the commercial side, electric vehicles (EVs) seem to be promising alternatives to replace the internal combustion engines, which can reduce the consumption of petroleum oil and CO<sub>2</sub> emission. However, up to date, the lack of suitable batteries with high energy density and excessive cost of the power sources have hindered the development and widespread market penetration of the EVs. Driven by the strong market pull, Bettergy has invented a novel ion selective membrane that can be employed along with Li<sub>2</sub>S based cathode material to develop the next generation lithium sulfur battery. This novel battery is expected to have 1) high specific energy ( $>500$  Wh/kg); 2) long cycle life ( $> 1000$  cycles); 3) long storage life and 4) great safety feature, which can meet the challenge requirements of the NASA mission.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Bettergy Corporation	Lead Organization	Industry	Peekskill, New York
 Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
New York	Ohio

## Project Transitions

**June 2014:** Project Start**December 2014:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137763>)

## Images

### Briefing Chart

High Performance Lithium Sulfur Battery with Novel Separator Membrane for Space Applications, Phase I  
(<https://techport.nasa.gov/image/126264>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Bettergy Corporation

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

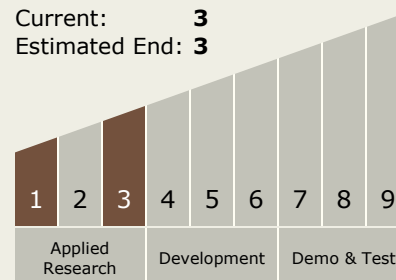
Carlos Torrez

### Principal Investigator:

Lin-feng Li

## Technology Maturity (TRL)

Start: **1**  
Current: **3**  
Estimated End: **3**



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## Technology Areas

### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.2 Energy Storage
    - └ TX03.2.1 Electrochemical: Batteries

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System